

# International Terrorists Threat to Nuclear Facilities

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# *Terrorist Threat to Nuclear Facilities - Introduction*

- Motivations for Past Terrorist Threats
  - Environmental
  - Financial Gain
  - Disgruntled Employees
- Motivation for New Terrorist Threats More Threatening
  - Revenge for National, Civilization, Decline
  - Source of Threat – International
  - Larger, Better Trained and Armed Groups
  - Use of Internet, Information Warfare Techniques
  - Highly Inventive, Non-Conventional Planning

# *Terrorist Threat to Nuclear Facilities – Introduction (Cont.)*

- New Terrorists Demonstrated Willingness to Sacrifice Themselves, Kill Countless Others, to Achieve Goals
- FBI Alert “...Terrorists may Favor Spectacular Attacks that Meet Several Criteria: High Symbolic Value, Mass Casualties, Severe Damage to the American Economy, and Maximum Psychological Trauma. The Highest Priority Targets Remain in the Aviation, Petroleum and Nuclear Sectors.....” November 14<sup>th</sup>, 2002
- Impact of Terrorist Attacks – Global.
- Successful Attack Against a Nuclear Facility Somewhere, is an Attack Against Nuclear Facilities Everywhere
- Nuclear Plants Hostages to Each Other’s Security Measures

# *Terrorist Threat to Nuclear Facilities – Impact*

- Enhanced Security Measures- Incremental 5-6 Million Dollars per Plant – NRC Chairman
- Higher O&M Costs Reduce Nuclear Competitiveness
- Current Natural Gas Prices Depressed due to Slow Economic Recovery
- Plant Security, Like Safety, is a Matter of Economics
- Consequences of a Successful Attack - Incalculable
- Need to Strike New Balance between Higher Security Costs – Risk Premium – and Imperative to Maintain Economic Competitiveness

# *Terrorist Attacks Against Nuclear Facilities*

- Purpose of Attack:
  - Cause Radiation Release – Damage to Public – Mass Panic
  - Cause Economic Damage (Utility, Cascading Effect, National Economy)
  - Theft of Radioactive or Fissile Materials for RDD
- Shutting Down a Nuclear Power Plant
  - Damaging Transmission Lines, Substation, Step-Up Transformers
  - Causing Variance with Tech. Specs. – Destroying External Make-Up Water Tanks
  - Projectile, Missile, Hit in Turbine Building
  - Disrupting the Primary System – Lucky Hit on Main Steam Lines
  - Attack on Spent Fuel Pool – PWR Fuel Buildings, BWR Mark I Containments' Spent Fuel Pool

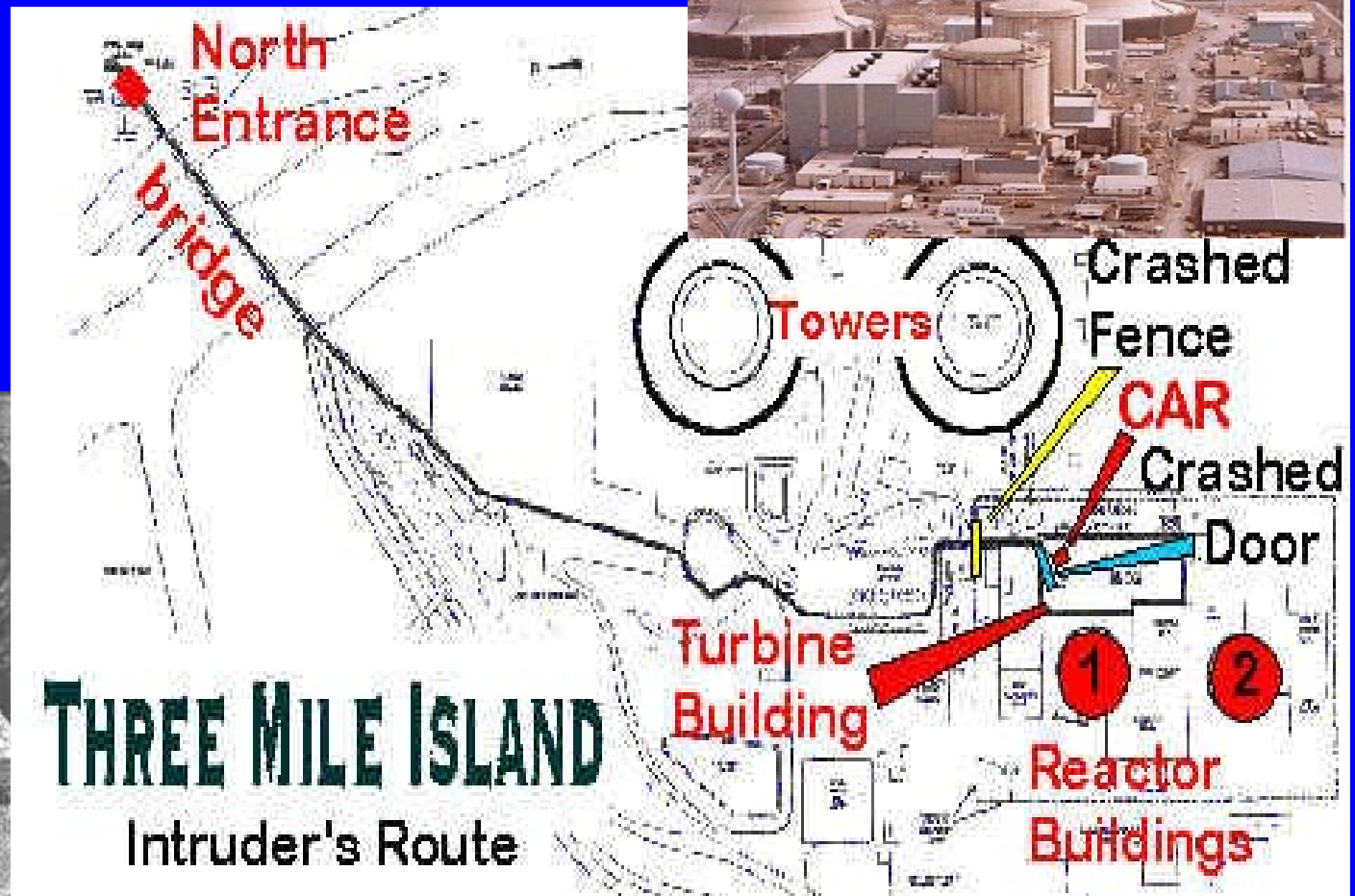
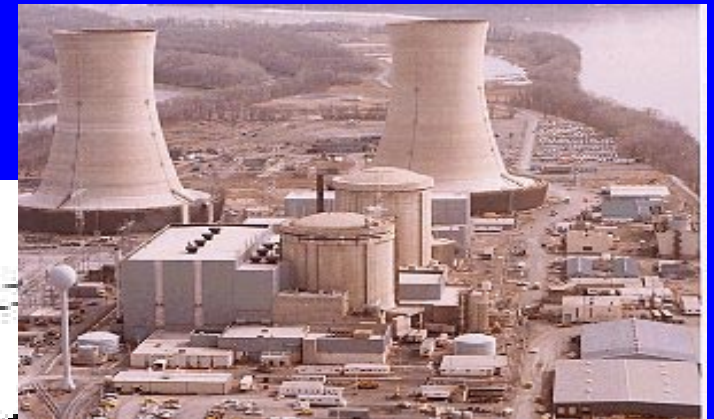
## ***ATTACKS CONSIDERED FEASIBLE\* (CONT.)***

### **Attack Modes Concerning the Vital Areas of a NPP (With Insider Assistance):**

- Blackmail of Staff Member
- Attack on External Power Supply
- Attackers Entering Through Visitor Center

\*NATO Nuclear Terrorism Expert Group (SST.CLG.978964), Sept. 2002

# Three Mile Island Intrusion



## ***ATTACKS CONSIDERED FEASIBLE\* (CONT.)***

### **Attack Modes Concerning the Vital Areas of a NPP (With Insider Assistance):**

- Convoy of Truck Bombs
- Sneak Attack Using Ultra-Light or Scuba-Divers, with Synchronised Diversion Attack
- Hijacking of Large Commercial Jet
- Diversion of Military Aircraft

\*NATO Nuclear Terrorism Expert Group (SST.CLG.978964), Sept. 2002



# *Terrorist Attacks Against Nuclear Facilities (Cont.)*

Plant System	Volume/Surface Area Presented to Attacker	Operational Damage To Plant	Radiological Consequences
Cooling Towers	Largest	Low to Medium (1)	Low (1)
Turbine-Generator Building	Large	Very High (2)	Low to Medium (3) (4)
Reactor Building	Medium	Medium to Very High (5)	Medium to Very High (4) (5)
Dry Cask Storage Facility	Medium	Low to Medium (6)	Medium to High (6)
Spent Fuel Storage Pool	Small	High (7)	Very High (7)

## *Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO)*

- Over 900 entries:
  - 670 Nuclear Smuggling Incidents (Thefts and Seizures of Nuclear and Other Radioactive Material From Illegal Possession)
  - 123 Orphan Radiation Sources (Lost, Stolen, Abandoned and Found Radiation Sources)
  - Over 100 Cases of Fraud, Loss of Control, Offers, Malevolent Acts Using Radiation Sources, and Illicit Trafficking in Dual-Use Material, Nuclear Technologies, Nuclear Weapons, etc.

# *Incidents of Material Diversion from Enrichment and Fuel Fabrication Facilities*

<b>Location and date of diversion</b>	<b>Material</b>	<b>Remarks</b>
Chepetsk 1992	Up to 300 kg of LEU (0.2-0.4%)	Russian security agents detained a group of criminals who had been stealing Uranium from the Chepetsk plant in Izhevsk and seized 140 kg of LEU. The material was diverted by the facility employees, who took the advantage of the accounting system, which allowed for a 4% 'loss of inventory'. Based on the incident, an inventory was conducted at the plant and 300 kg were found to be missing. Parts of the diverted material are believed to have been seized in Poland, Belarus, Lithuania, Russia, and Chechnya between 1992 and 2002.
Electrostal 1993	115 kg of LEU	In 1993, a metalworker from Electrostal diverted 115 kg of LEU pellets, 5 kg at a time. He was caught only in 1996, while attempting to find a buyer for the material. The employee admitted that he had stolen the material out of desperation: he was supporting a family of three children on one salary and had not been paid for months.
Electrostal Before 1/1994	3.2 kg of 3.6% LEU	In January 1994, a vice-president of a prominent Obninsk firm was arrested in possession of a container of LEU. The man's brother, a resident of Elektrostal, turned out to have obtained roughly 30 times more Uranium than his brother. Apparently, the material was stolen from the Electrostal plant.
Electrostal Before 6/1994	3 kg of 90% HEU	In June 1994, police in St. Petersburg arrested three men trying to sell 3 kg of 90% enriched HEU, which they had smuggled from Electrostal plant.
Electrostal May 1994	1.7 kg of 21% HEU	Three men were arrested in a sting operation in Moscow in June 1995, trying to sell 1.7 kg of HEU. One of the suspects, a metalworker at the Electrostal plant, managed to carry the material out of the factory in 'an ordinary shopping bag full of apples' because the portal monitors were not working and did not set off any alarms.
Electrostal 1995	Pu pellet	In January 1995, a Plutonium pellet was reportedly diverted from the Electrostal plant. The incident has not been officially confirmed.
Electrostal 5/1995	11 kg of 3.6 kg LEU	Russian police and security services arrested the chief engineer of the "Mobrez" enterprise and an operator at the "Engineering Plant" joint -stock company at the Elektrostal fuel assembly facility for stealing 11 kg of LEU used in a fuel rod.
Ulba 12/1995	149.8 kg of 3.3% LEU	On December 7, 1995, Kazakhstani security service detained two Kazakh citizens in Ust -Kamenogorsk during an attempt to transport of 4.1 kg of LEU to buyers in Russia. In the course of the investigation, an additional 145.7 kg of LEU was discovered in the possession of the two men.
Electrostal Before 5/2000	3.7 kg of 21% HEU	In May 2000, a resident of Electrostal was detained during an attempted sale of 3.7 kg of HEU. The incident was reported by Gosatomnadzor. Electrostal was named as a possible origin of the material, together with the Bochvar Institute (VNIINM) and Politech enterprise, Russia

# *Incidents Involving Material Diverted from Research Reactors and Research Facilities*

<b>Location of incident and date of diversion</b>	<b>Material</b>	<b>Origin of material</b>	<b>Incident description</b>
Podolsk, Russia 5/92-9/92	1.5 kg of 90% HEU	Luch Scientific Production Association, Podolsk, Russia	In October 1992, Russian police arrested a man in possession of HEU in the Podolsk train station as part of an unrelated investigation.
Vilnius, Lithuania Early 1992	100 g of 50% HEU	Institute of Physics & Power Engineering, Obninsk, Russia	In May 1993, approx. 100 g of HEU was discovered in Vilnius bank vault embedded in portions of a transit shipment of four metric tons of beryllium.
Tengen, Germany Before 5/1994	6 g of Pu-239	Unconfirmed, possibly Arzamas-16, Russia	In May 1994, police found the cache of Plutonium during the search of the apartment of the suspect accused of counterfeiting.
Landshut, Germany Before 6/1994	800 mg of 87.7% HEU	Unconfirmed, likely Obninsk, Russia	In May 1994, Bavarian undercover police were given a sample of HEU believed to have come from Russia.
Munich, Germany Before 8/1994	363 g of Pu-239	Unconfirmed, likely Obninsk, Russia	In August 1994, German undercover agents seized 363 g of Pu-239 in the Munich airport. The material was brought on a Lufthansa flight from Moscow.
Prague, Czech Republic Before 12/1994	2.7 kg of 87.7% HEU	Unconfirmed, likely Obninsk, Russia	Acting on a tip, the police found two canisters of HEU identical to the sample seized in Landshut inside a car near a Prague restaurant on Dec. 14, 1994. Two more HEU samples with the same enrichment level, believed to have come from the same source, were seized in the Czech Republic (Prague and Ceske Budejovice) in June 1995.
Sukhumi, Georgia 1992-1997	Approx. 2 kg of 90% HEU	I.N. Vekua Physics & Technology Institute, Sukhumi, Georgia	Up to 2 kg of 90% HEU disappeared from the Sukhumi Institute of Physics and Technology during the civil Abkhazian-Georgian conflict between 1992 and 1997.
Rome, Italy 2/1998	Fuel rod (190 g) of 19.9 LEU	TRIGA II research reactor, Kinshasa, Congo	In February 1998, a Uranium fuel rod (19.9%), stolen from the Kinshasa research reactor in the Congo, was seized from members of Italian mafia clans.
Chelyabinsk Oblast, Russia 1998	18.5 kg of HEU (enrichment level unspecified)	Unknown, possibly Mayak Production Association, Chelyabinsk-70, or Zlatoust-36, Russia	In December 1998, Russian Federal Security Service reported about a thwarted attempt by the employees at a nuclear facility in Chelyabinsk oblast to divert 18.5 kg of nuclear material. A Minatom official confirmed that the incident involved HEU.
Karlsruhe, Germany	Pu	Karlsruhe Nuclear Center, Karlsruhe,	In July 2001, an employee of the former nuclear fuel reprocessing centre in

# Threats and Actual Attacks on Nuclear Power Plants

Location and date of incident	Incident description
Lyon, France 1/1982	Five anti-tank rockets were fired at the Creys -Malville Super phoenix reactor near Lyon, France. Apart from the outer building wall, little damage was done by the attack because the reactor was still under construction. An environmentalist group, the Pacifist and Ecologist Committee, claimed responsibility for the attack. <sup>1</sup>
Three Mile Island, USA 2/1993	According to Three Mile Island Alert, before the World Trade Center attack in 1993, terrorists had trained only 30 miles from Three Mile Island, where they practiced nighttime mock assault on an electrical power substation. Four days after the World Trade Center bombing in 1993, terrorists calling themselves the "Liberation Army Fifth Battalion" threatened in a letter to the New York Times to attack also nuclear targets with 150 suicide soldiers. <sup>2</sup>
Balakovo NPP, Saratov, Russia Fall 1996	Russian nuclear regulatory agency, Gosatomnadzor, received a warning that a group of armed Chechens was moving toward the Balakovo nuclear power plant, a station with four VVER-1000 reactors located near Saratov, Russia. However, while a group of Chechens was found to be moving along the Volga, they stopped well before Balakovo and it was impossible to confirm if the group indeed intended to strike the nuclear power station. <sup>3</sup>
Kursk NPP, Russia Spring 1997	Five men were caught after penetrating the Kursk nuclear power station, which houses four RBMK-1000 reactors. The suspects had reached the plant generator and reportedly intended to seize the control room and disable the reactor. <sup>4</sup>
Saratov Oblast, Russia Before summer 1999	A court hearing conducted in the summer 1999, revealed that a 30-year-old resident of Saratov Oblast, who was charged with plotting an assassination attempt on the Governor of Saratov Oblast, had made detailed plans of seizure of nuclear facilities. The plans were found in the course of the investigation. <sup>5</sup>
Crystal River Plant, Florida, USA 12/1999	In the summer of 2000, a man was sentenced to 5 years in prison for plotting to attack power lines leading to the Crystal River Plant in Florida in December 1999. There were no indications that the plot had developed beyond the discussion stage, and there was no plan to attack the plant directly. <sup>6</sup>

<sup>1</sup> Gavin Cameron, "Nuclear Terrorism...".

<sup>2</sup> "Terrorists Train Near Three Mile Island" on the web -site of an action group "Three Mile Island Alert" <http://www.tmia.com/threat.html>.

<sup>3</sup> William C. Potter, "Less Well-Known Cases of Nuclear Terrorism and Nuclear Diversion in the Former Soviet Union," Center for Nonproliferation Studies, August 1997; in the NIS Nuclear Profiles database <http://www.nti.org/db/nisprofs/over/nuccases.htm>.

<sup>4</sup> Ibid.

<sup>5</sup> Ivan Safranchuk, "Bud' gotov k yadernomu terrorizmu" [Be Prepared for Nuclear Terror], *Itogi*, October 12, 1999.

<sup>6</sup> US Nuclear Regulatory Commission, Annual Safeguards Summary Event List 2000, NUREG-0525, Vol.4).

# *Incidents and Attempts of Material Diversion from Nuclear Power Plants*

<b>Location and date of diversion</b>	<b>Material</b>	<b>Incident description</b>
Ignalina, Lithuania 8/1992	Fuel assembly containing 111 kg of 2% LEU	A 7 meter long fuel assembly weighing 270 kg and containing 111 kg of LEU was stolen from the Ignalina NPP in August 1992. It left the premises of the facility attached to the bottom of a duty bus. The investigation revealed that the theft had been implemented by the reactor operation personnel and the guards. About 80 kg of the stolen LEU are said to have been recovered on several occasions between 1992 and 2002
Chernobyl, Ukraine 10/1993	7.62 kg of 2% LEU	Two fuel rods were cut off from a fuel assembly at the nuclear power plant and disappeared. A portion (1.5 kg) of the missing LEU was apparently seized in January 2002 in Minsk, Belarus, from a trafficking ring, which included a former employee of the Chernobyl NPP who worked as a foreman at the time of theft.
Khmelnitsky, Ukraine 3/2000	LEU	Ukrainian television reported that in March 2000 that "a group of dealers" attempting to steal nuclear fuel from the Khmelnytsky NPP and smuggle it out of the country was uncovered. The report said that members of the group have been arrested, but did not give details regarding its size or whether it included plant personnel.
Metzamor, Armenia* Before 12/2001	300 g of LEU	In December 2001, Georgian law enforcement authorities arrested an Armenian citizen in the Samtskhe-Javakheti region, who was trying to smuggle 300 g of LEU. Police had strong suspicions that the seized Uranium had been stolen from the Armenian Metzamor nuclear power plant.

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\* This diversion has not been confirmed. Please see incident description for details.

## *Worrisome Statistics*

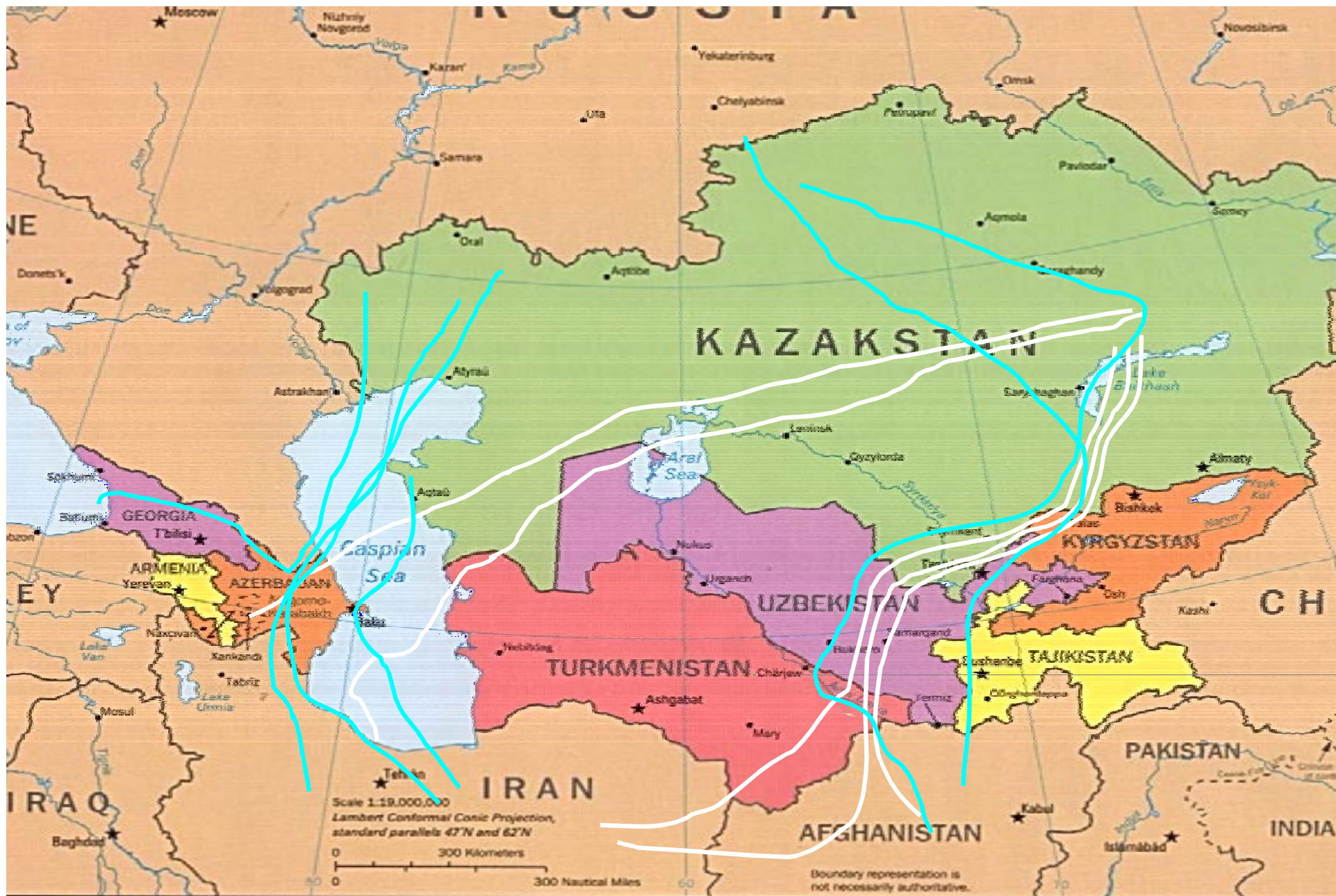
- According to DSTO (*High Credibility*), a Total of **39 Kg** of Weapons-Usable Material (HEU and Pu-239) Have Been Seized Worldwide Between 1992 and 2002
- All of This Material = Originated From Nuclear Facilities in Russia
- Of these 39 Kg:
  - 18.5 Kg Were Seized During an Attempted Theft
  - 16.5 Kg Were Stolen Undetected and Seized Later During Attempts to Sell the Material in Russia
  - 4 Kg Were Seized Outside Russia
- Up to 2 Kg of 90% HEU Went Missing From the Sukhumi Research Facility, Abkhazia, Between 1992-1997

## Eastern Europe



# Trafficking Routes (DSTO)





From Russia



From Kazakhstan

# *Tip of the Iceberg?*



- Law Enforcement Officials in the US Seize Only 10 to 40% of the Illegal Drugs Smuggled Into the Country Each Year
- Russia Stops From 2 to 10% of Illegally Imported Goods and Illegal Immigrants on the Border With Kazakhstan

## *International Terrorist Threat to Nuclear Facilities - Conclusions*

- Terrorist Threat to Nuclear Facilities – A Risk That Can Not Be Ignored
- Terrorists Motivation & Capabilities- Higher Than in the Past
- The Threat is Global. Successful Attack Abroad Will Have Significant Consequences At Home
- Security, Like Safety, is a Matter of Economics
- Current Response Measures Increase O&M Costs
- Balance Between Costs of Enhanced Security and Economic Competitiveness - Essential

## *International Terrorist Threat to Nuclear Facilities – Conclusions (Cont.)*

- Industry Should Establish Coordinated Security Response Program, Similar to O&KM Cost Initiative of 1990s, Coordinated Through NEI, INPO, EPRI
- Response Plan Should Address:
  - Adequacy of DBT
  - Vulnerability Assessment Procedures
  - Standards for Guard Force Training
  - Standards for Response, Countermeasures
  - Interaction with Off-Site, Non-Utility Response Force
- Industry Response Plan Essential for Dealing with NRC, Newly Established HSD

## *International Terrorist Threat to Nuclear Facilities – Conclusions (Cont. II)*

- Pro-active Coordinated Utility Program will Support Demands for Government Security Burden-Sharing
- Need to Develop Improved Coordination , Detailed Procedures, for Plants Interactions with Local Law Enforcement Agencies, FAA, National Guard, Coast Guard, CDC, and Federal Agencies of HSD, DOJ, HSD
- Need to Demand Lower Security Insurance Premiums for Plants Meeting Industry and Government Approved Standards for Plant Protection
- Need to Re-establish Contacts with National Laboratories in Areas of Plant Security Technologies

# Defenses of NPP Against Airborne Attacks



- Better Security for Commercial Airlines
- No-Fly Zones Above Nuclear Power Plants
- Deployment of Anti-Aircraft Missiles

## *International Terrorist Threat to Nuclear Facilities – Conclusions (Cont.III)*

- Need to Develop International Enhanced Security Programs through WANO, Building on U.S. INPO Programs
  - Plant Twinning Arrangements – Useful
- Establish Joint Plant Security R&D Programs with IAEA, EU Research Organizations
- Industry Should Track International Trends in Materials Diversion, Study Implications for U.S. Plants
- Industry Should Demand Enhanced Security Measures on International Transactions in Fuel Cycle Material Flows



# *International Terrorism and Technology*

- Attack Technology is Selected to Use the Vulnerability of Modern Society
- The Higher the Level of Counter-Terrorism Measures, the Higher the Probability for Terrorists to Deploy WMK or WMD
- The Dissolution of the FSU and the Decay of Some Countries Offer a Unique Opportunity:
  - High-Tech Weapons Technology
  - Know-How
  - Basic Know-How on WMK and WMD is Easily Accessible (Internet)